

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
26 February 2004 (26.02.2004)

PCT

(10) International Publication Number  
WO 2004/016393 A1

(51) International Patent Classification<sup>7</sup>: B24D 7/18, B24B 9/00, B23B 5/16

(21) International Application Number: PCT/GB2003/003563

(22) International Filing Date: 14 August 2003 (14.08.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data: 0219120.3 16 August 2002 (16.08.2002) GB

(71) Applicant and  
(72) Inventor: LARWOOD, Michael, Edward, John [GB/GB]; 12 Nightingale Close, Denver, Downham Market, Norfolk PE38 0DT (GB).

(74) Agent: I.P. 21 LIMITED; Norwich Research Park, Colney, Norwich, Norfolk NR4 7UT (GB).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

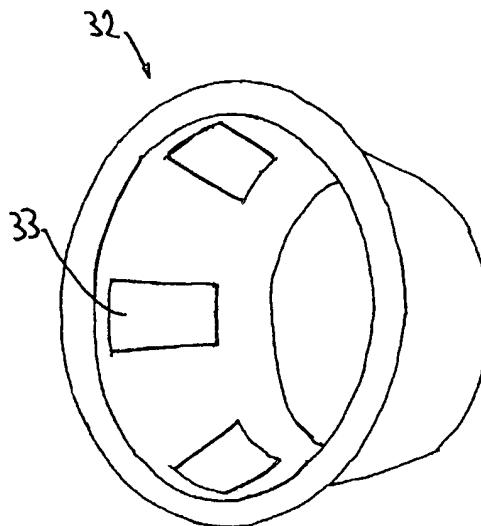
(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:  
— of inventorship (Rule 4.17(iv)) for US only

Published:  
— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: CHAMFERING TOOL



WO 2004/016393 A1  
(57) Abstract: A hand-held tool for chamfering the end regions of pipes or the like consists of a collar (1), one surface (3) of which incorporates abrasive means (4) and allows mating engagement, when in use, with a corresponding article destined for chamfering, and another surface (2) incorporating means facilitating manual gripping about the periphery of said collar (1) and/or about a handle stretching across said collar (1) so that the rotation of the operator's hand translates directly into the rotation of the collar(1).

## CHAMFERING TOOL

### Field of the Invention

The invention relates to the tools used for chamfering the end regions of pipes or the like and more particularly those that are hand held.

### Background to the Invention

5 Tools and methods for chamfering pipe ends have been devised previously. A large proportion of these such as that presented in patent application US 4114484 focuses on power driven tools which are often complicated and voluminous. Other conventional tools and methods achieve chamfering automatically without visual control or manual action such as US patent document 4840096. In order to 10 achieve the manual chamfering of the end regions of pipes, rasps with the conventional spatula shape are readily available in the market place. Using this kind of implement, requires the operator to have a high level of dexterity and know-how to achieve the desired chamfered effect at the pipe ends. Furthermore,

this kind of rasp is often bulky and may therefore only be used where the pipe end is easily accessible.

From this starting point, one of the objectives of the present invention is to present a hand held tool for chamfering the end regions of pipes or the like which is 5 compact. Its compactness would be sufficient for example for operation around the end of a pipe which is particularly difficult to access and that would not allow the use of conventional tools.

While being compact, the tool of the present invention aims at being particularly ergonomic. It is therefore a particular objective of the present invention to provide 10 gripping means of a kind which maximises the rotation transferred from the hand to the tool while reducing the effort required to achieve the necessary chamfering.

It is a further objective of the present objective of the present invention to present configurations of abrasive means destined to enhance their performance.

It is also an aim of the present invention to provide a tool which presents a 15 reduced number of components as compared to conventional systems and by so doing reduce the cost of manufacture of the tool.

#### Summary of the Invention

In its broadest aspect, the invention presents a hand-held tool for chamfering the end regions of pipes or the like, the tool consisting of a collar, one surface of 20 which incorporates abrasive means and allows mating engagement, when in use, with a corresponding article destined for chamfering, and another surface incorporating means of facilitating manual gripping about the periphery of said collar and/or about a handle stretching across said collar so that the rotation of the operators hand translates directly into the rotation of the collar.

This grouping of features presents a particularly compact tool which can be efficiently handled while at the same time achieving the abrasion of the end regions of pipes or the like. The collar shape of the tool is also particularly advantageous, not only in terms of handling, but also as it achieves great

5 mechanical strength when submitted to the operational forces during chamfering. While being particularly compact and mechanically durable, the configuration of the tool in its broadest aspect is sufficiently efficient in abrasion to do away with any requirement of being power driven. As a consequence, the invention's tool requires no specifically designed safety mechanism as is often required in the

10 prior art's power driven chamfering devices.

In a subsidiary aspect in accordance with the broadest aspect of the present invention, the means facilitating manual gripping comprises projections and/or recesses defining areas destined to receive, when in use, one or more of the operators fingers, and wherein the means to facilitate manual gripping correspond

15 essentially to the contour of the operators fingertips and are suitably ergonomically spaced about the periphery of said collar.

Ergonomically spacing the means to facilitate manual gripping about the periphery of the collar, is particularly advantageous because it minimises the force required to rotate the collar and therefore achieves a more rapid chamfering of the

20 end regions of pipes or the like.

In a further subsidiary aspect, the abrasive means is releasably attached to the collar and comprises a rigid or alternatively a resilient strip fitting wholly or partly around the collar.

25 In a further subsidiary aspect, the abrasive means are located about the collar at intervals, each interval being within the range of 70 to 180 degrees.

In a further subsidiary aspect, the abrasive means comprises locations of one or more teeth placed at intervals, each interval between the locations being within the range of 70 to 180 degrees.

5 Placing the teeth at intervals in this manner is particularly advantageous because it minimises the chamfering effort and the required number of teeth while it maximises the cutting rate.

In a further subsidiary aspect, the abrasive means comprises three locations each of one or more teeth and all placed at approximately 120 degree intervals.

10 A normal hand will effortlessly repeatedly rotate clockwise and anti-clockwise over an angle of 120°. This configuration therefore minimises the number of cutting teeth required to achieve the required chamfering.

15 In a further subsidiary aspect, a first proportion of the abrasive means is adapted to cut when the collar is rotated in the clockwise direction and a second proportion of the abrasive means is adapted to cut when said collar is rotated in the anticlockwise direction.

This configuration is particularly advantageous because it maximises the efficiency of the abrasive means and therefore reduces the effort required in chamfering the pipe.

20 In a further subsidiary aspect, the abrasive means comprises teeth which are orientated at angles from the diameters of the collar other than essentially 90°.

Orientating the teeth at angles from the diameters of the collar other than essentially 90° has the advantageous effect of gradually urging the swarf generated by the abrasive means to exit the collar. By effortlessly removing the

swarf from the collar, the abrasive means have an enhanced cutting effect on the pipe's surface which in turn further reduces the effort required in chamfering.

#### Brief Description of the Drawings

5 Figure 1 shows a perspective view of a collar in accordance with a first embodiment of the invention.

Figure 2 presents a side view of a collar in the context of a second embodiment of the invention.

Figure 3 illustrates a schematic end view of a collar according to a third embodiment of the invention.

10 Figure 4 shows a cross-sectional view across a diameter of the collar in the context of a fourth embodiment of the invention.

Figure 5 shows a schematic perspective view of a collar of a fifth embodiment of the invention.

Figure 6 shows a further schematic perspective view of the invention in a sixth illustrative embodiment.

15 Figure 7 illustrates a perspective view of a collar in accordance with a seventh illustrative embodiment.

Figure 8 shows a perspective view of the abrasive strip according to the seventh embodiment of the invention.

Figure 9 illustrates a further schematic perspective view of an eighth embodiment of the invention.

Detailed Description of the Drawings

Figure 1 presents a collar 1 in the shape of a section of a frusto-conical figure. Consequently, the diameter of collar 1 gradually decreases in figure 1 from right to left. This decreasing diameter will permit in use the formation of a chamfer of 5 the end of a pipe with a slope that will precisely correspond after abrasion to the slope of collar 1.

The tool of this invention is primarily intended to be used in conjunction with pipes. However, the invention also envisages the tool to be used in the context of articles which are similar to pipes such as rods or any other article whose 10 dimensions require to be truncated.

Collar 1 incorporates an outer surface 2 which is destined for the application of the operator's grip. Collar 1 comprises an inner surface 3 with circumferentially spaced teeth 4. Each of these teeth is arranged perpendicular to the diameters of collar 1. The material employed for these teeth will be selected by the person 15 skilled in the art from a range of known hard metals and plastics. The invention envisages utilising the same material for the collar and its teeth so that it may be particularly simple to manufacture by a known process such as moulding.

The invention also envisages that the sum of the volume between the blades is equal or greater than the volume of swarf obtained in the abrasion process. 20 Incorporating this latest feature into the collar will maximise the efficiency of the abrasive process.

Figure 2 presents a collar 5 which again is frusto-conical, i.e. has the shape of the bottom section of a cone. A pipe (not illustrated in the drawing) enters collar 5 at its extremity 6 until it abuts against abrasive means 7. Abrasion is achieved by

gripping collar 5 and rotating it around an inserted pipe. In order to improve the gripping of the collar, a handle 8 extends across the smaller diameter of the collar 5. While ameliorating the ease with which the collar is rotated, handle 8 has the further advantage of strengthening the collar.

5 Figure 3 shows a further collar 9 which has the particularity of only having three teeth 10 which are spaced at intervals of 120°. In this configuration, a rotation of 120° will result in cutting the entire circumference of an article inserted in the collar. A cyclic rotation of a clockwise rotation of 120° followed by an anti-clockwise rotation of 120° will achieve accelerated cutting of the pipe's outer  
10 surface.

Figure 4 shows a further collar 11, this time in cross-section. Collar 11 is provided with abrasive means 12 along the entire inner surface of the collar. The outer surface 13 of the collar has three recesses 14, 15 and 16. These recesses have been suitably ergonomically spaced along the outer surface. In this  
15 particular embodiment, suitably ergonomically spaced signifies that recess 14 is destined to accommodate a thumb while recess 15 accommodates the index and recess 16 the fourth finger. It is thought that it is particularly advantageous to provide recesses for only these three fingers. The current invention also envisages other configurations which enhance the efficiency and ease of the rotation of the  
20 operators hand in conjunction with the collar.

Each of the above described recesses, incorporate a cushioning means 17, 18 and 19 to improve the grip achieved on the collar. It is also envisaged that these cushioning means may have, in relation at least to the material of the collar as a whole, a high co-efficient of friction to limit slippage during the rotation of the  
25 collar. It is also advantageous for these cushioning means to be sufficiently porous to absorb any sweat that may be generated during the rotation or other liquid that may be present in the vicinity. The materials used to achieve properties

of cushioning, high friction and absorption will be selected by the person skilled in the art amongst known alternatives.

Figure 5 displays a further embodiment of a collar 20. The outer surface of the collar shows two recesses 21 and 22 whose geometry advantageously follows the 5 contour of the operator's fingertips (not illustrated in the drawing). Three other such recesses are provided along the outer surface at ergonomic distances from each other (these recesses are not shown in the figure). These recesses have the further particularity of presenting an array of micro-projections which further improve the efficiency of the operator when gripping the collar and rotating it.

10 The inner surface is equipped with teeth 23 which have the particularity of being approximately 30° from perpendiculars such as that referenced at 24. Whilst angles of 30° have been used in this embodiment advantages become apparent, primarily within the range of 30 - 70°. One of the advantages of angling the teeth is an enhancement of the cutting efficiency of the collar. Another advantage of 15 this configuration is that the swarf is encouraged to gradually exit the collar during use, in this embodiment in a direction from the large diameter to the small diameter of the collar.

Figure 6 represents a collar generally referenced at 25 incorporating two sets of 20 blades 26 and 27. Blades 26 are orientated to primarily cut during the clockwise phase of the rotation of the collar while blades 27 are orientated in the opposite direction to blades 26 in order to primarily cut during the anti-clockwise phase of the rotation.

Figure 7 shows a collar generally referenced 28 this collar incorporates an end 25 wall 29 which is destined to further strengthen the collar particularly in compression during the rotation about the extremity of a pipe. An annular projection 30 extends at the open end of the collar. This annular projection forms a surface against which the operator's hand may abut during use and thus protects it from any possible accident resulting from the operator's hand slipping from its

grip. This annular projection also strengthens the collar in both compression and tension.

In this embodiment an abrasive strip 31 is positioned within the collar. This abrasive strip has the particularity of being mounted releasably within the collar.

5 Appropriate attachment means will facilitate the mounting of the strip within the collar. For example, the strip 31 may be provided with a hole into which a screw mechanism may be inserted in order to fix the strip in relation to the collar.

10 Figure 8 shows a strip 34 of the type which may be placed around the collar. The strip is sufficiently resilient to be flat and then bent to form a circle as shown on the drawing. The ends of the strip are provided with holes 35 and 36 which may receive a screw 37 to facilitate the attachment to the collar.

15 Figure 9 illustrates a collar 32 incorporating a series of abrasive pads such as that referenced at 33. Such pads may be individually releasably attached to the inner surface of the collar. It is however envisaged that each abrasive pad is fixed using an appropriate bonding substance such as superglue.

Every preceding embodiment has illustrated collars which achieve the outer chamfering of pipes or the like, the invention however is not limited to collars which permit the chamfering of the outer surface. The skilled person will without recourse to inventive thought adapt these preceding embodiments to design 20 similarly inventive collars susceptible of chamfering the inner section of pipes or the like.

CLAIMS

1. A hand-held tool for chamfering the end regions of pipes or the like, the tool consisting of a collar, one surface of which incorporates abrasive means and allows mating engagement, when in use, with a corresponding article destined for chamfering, and another surface incorporating means facilitating manual gripping about the periphery of said collar and/or about a handle stretching across said collar so that the rotation of the operator's hand translates directly into the rotation of the collar.  
5
2. A tool according to claim 1, wherein the means facilitating manual gripping comprises projections and/or recesses defining areas destined to receive, when in use, one or more of the operator's fingers, and wherein the means to facilitate manual gripping correspond essentially to the contour of the operator's finger tips and are suitably ergonomically spaced about the periphery of said collar.  
10
3. A tool according to any preceding claim, wherein the abrasive means is releasably attached to the collar and comprises a rigid or alternatively a resilient strip fitting wholly or partially around the collar.  
15
4. A tool according to any preceding claim, wherein the abrasive means are located about the collar at intervals, each interval being within the range of 70 to 180 degrees.  
20
5. A tool according to any preceding claim, wherein the abrasive means comprises locations of one or more teeth placed at intervals, each interval between the locations being within the range of 70 to 180 degrees.

6. A tool according to claim 5, wherein the abrasive means comprises three locations each of one or more teeth and all placed at approximately 120 degree intervals.
- 5 7. A tool according to any preceding claim, wherein a first proportion of the abrasive means is adapted to cut when the collar is rotated in the clockwise direction and a second proportion of the abrasive means is adapted to cut when said collar is rotated in the anti-clockwise direction.
- 10 8. A tool according to any preceding claim, wherein the abrasive means comprises teeth which are orientated at angles from the diameters of the collar other than essentially 90 degrees.
9. A chamfering tool substantially as hereinbefore described with reference to and/or illustrated in any appropriate combination of the accompanying text and drawings.

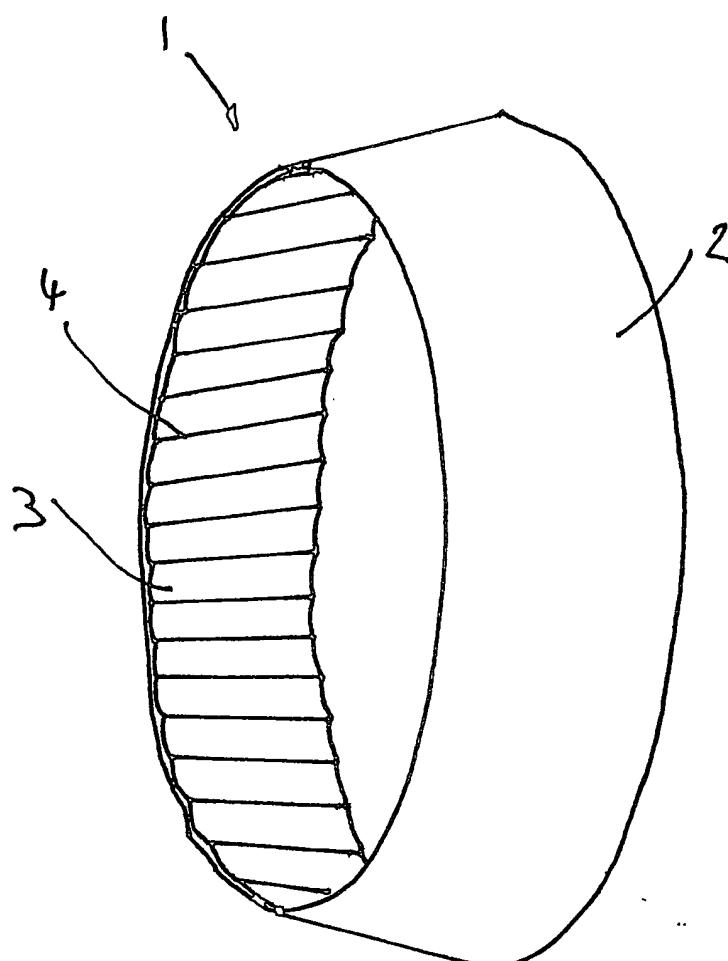


FIGURE 1

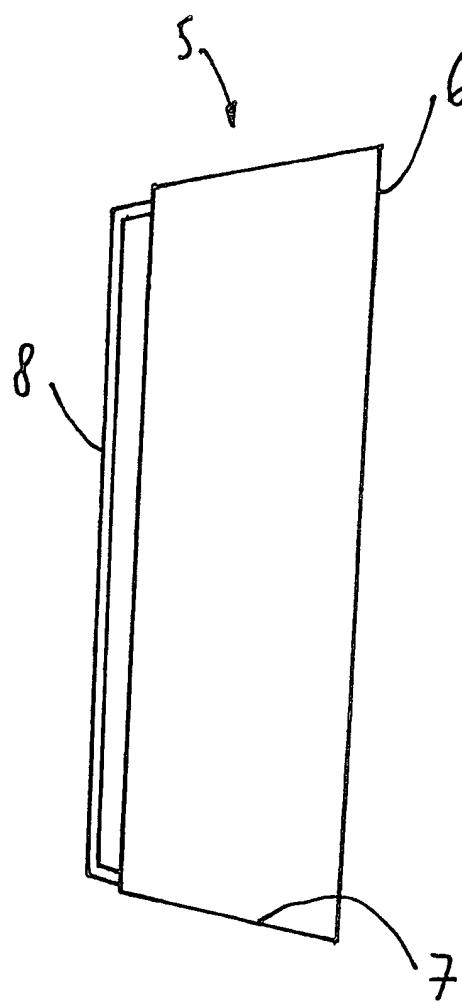


FIGURE 2

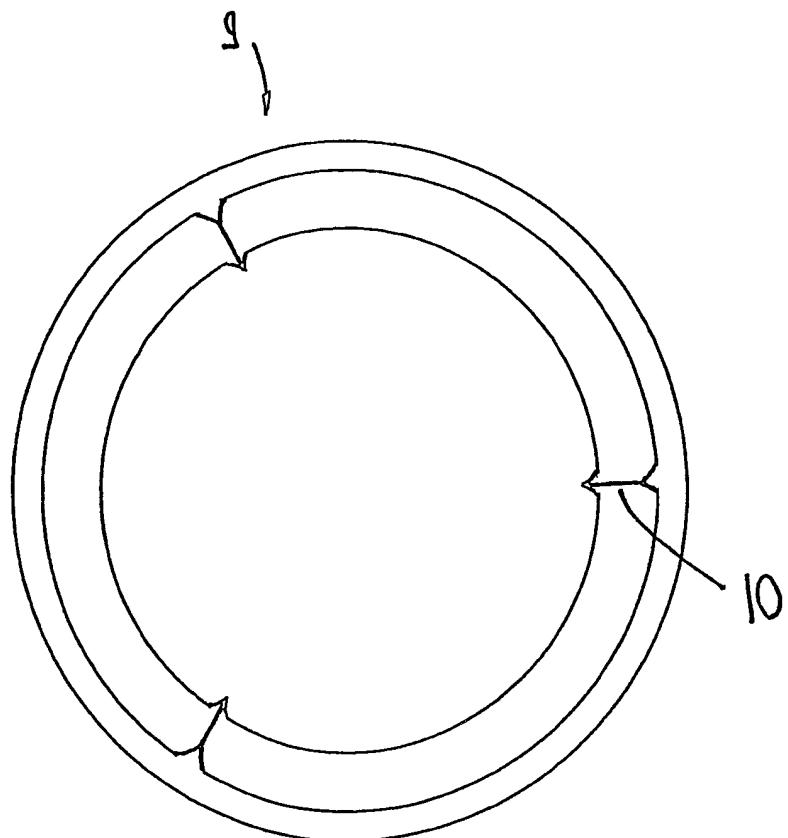


FIGURE 3

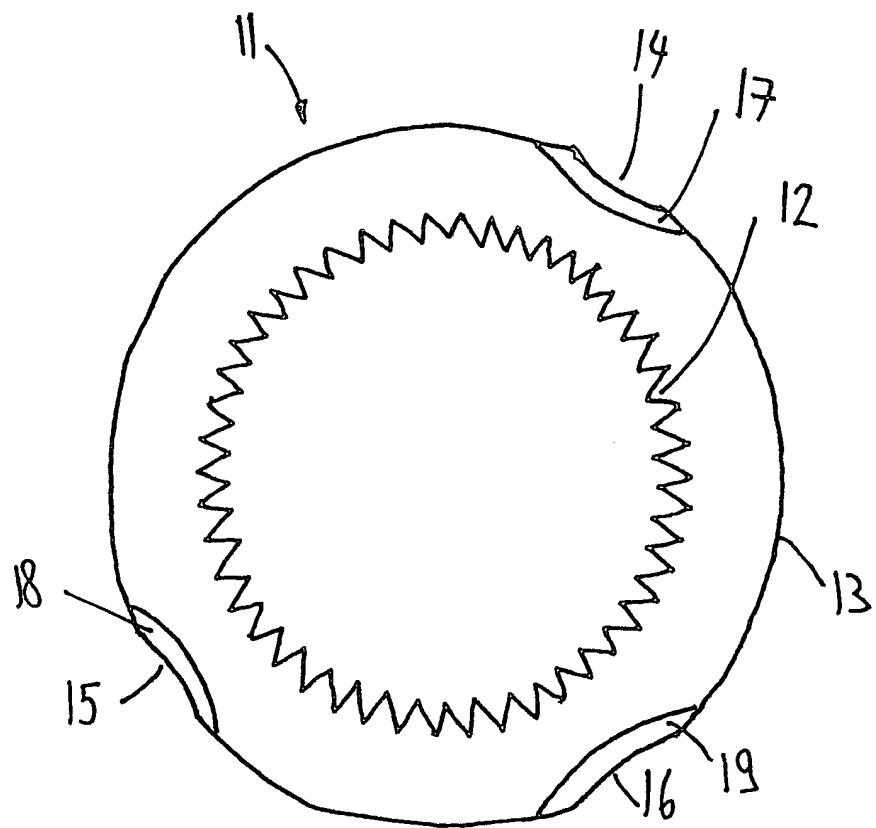
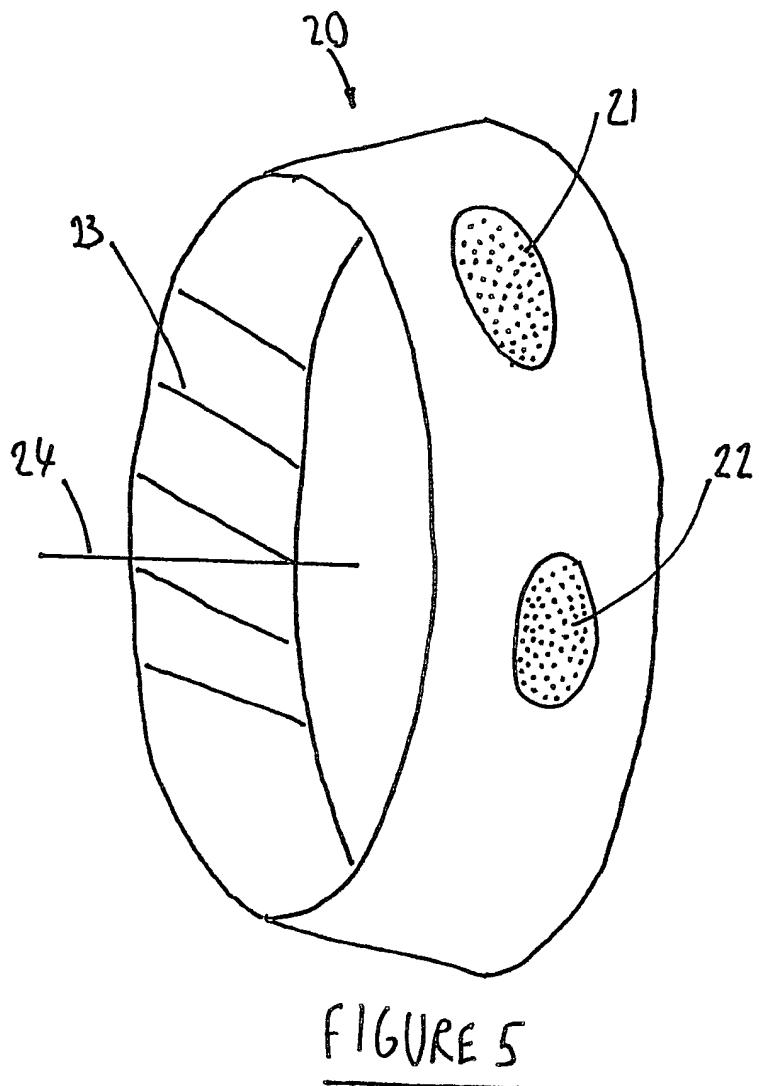


FIGURE 4



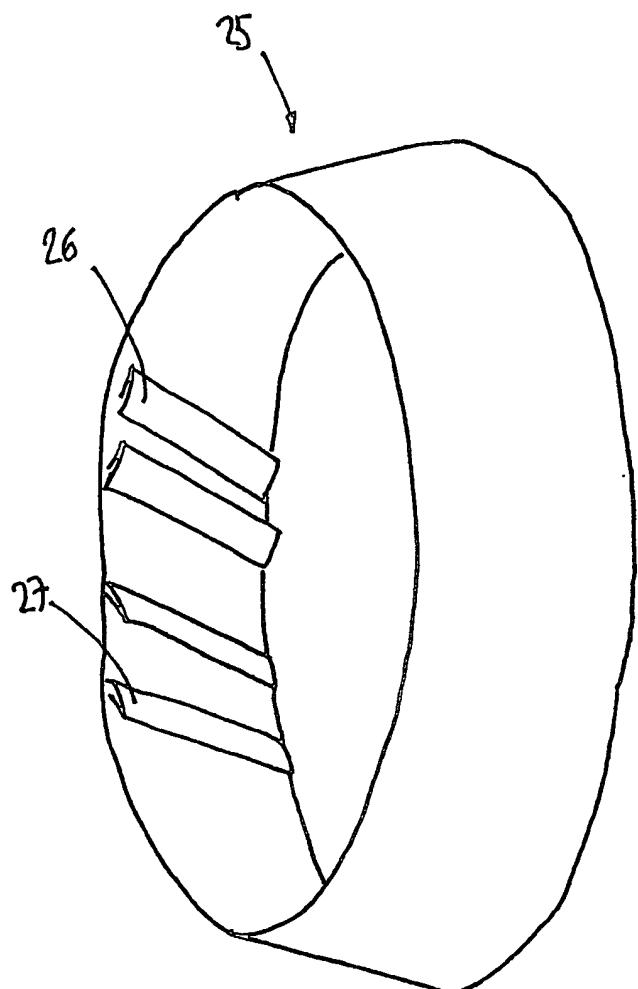


FIGURE 6

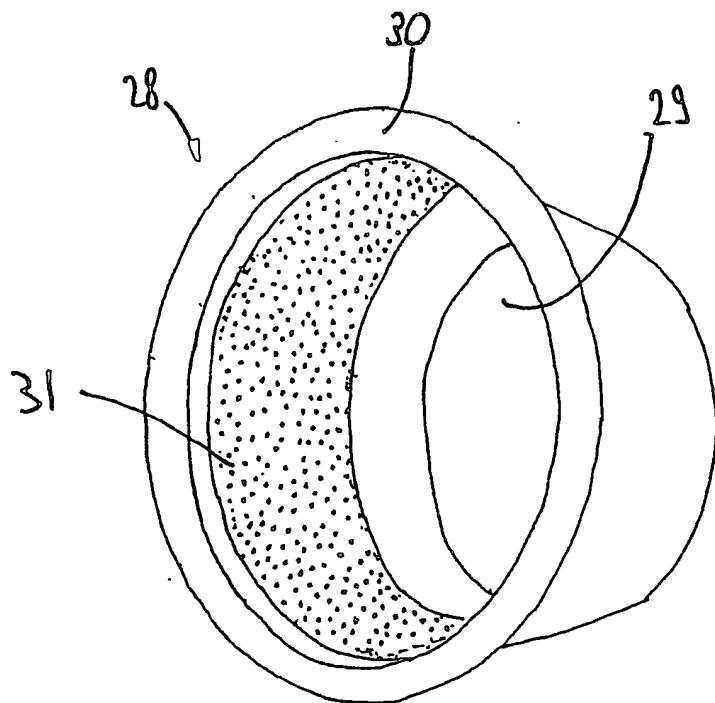


FIGURE 7

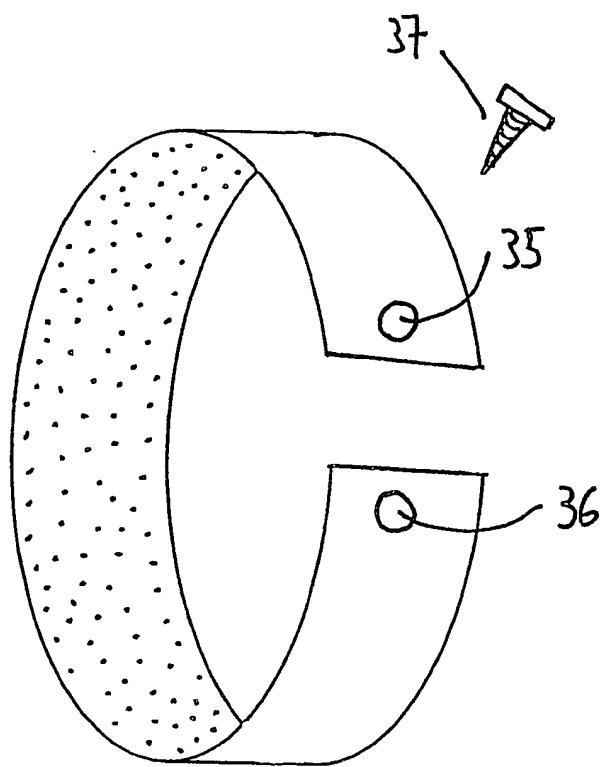


FIGURE 8

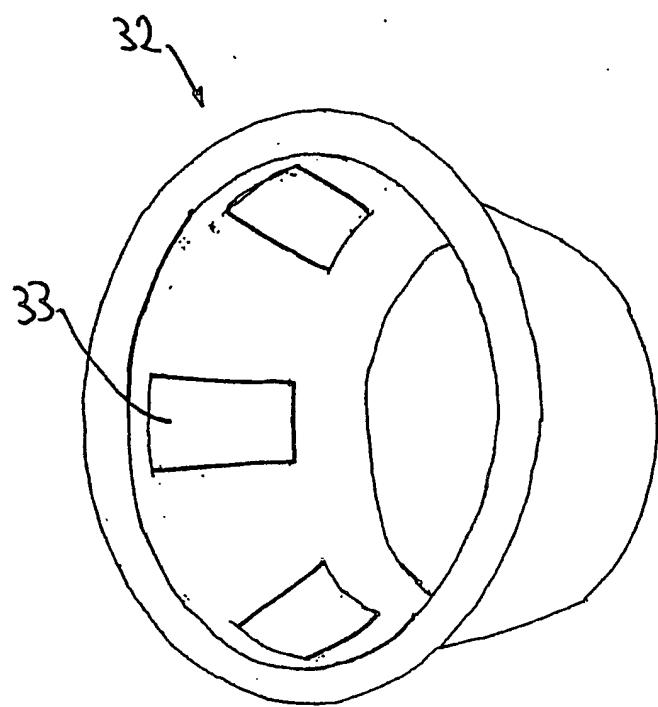


FIGURE 9

## INTERNATIONAL SEARCH REPORT

Internat Application No  
PCT/GB 03/03563

<p><b>A. CLASSIFICATION OF SUBJECT MATTER</b></p> <p>IPC 7 B24D7/18 B24B9/00 B23B5/16</p>																								
<p>According to International Patent Classification (IPC) or to both national classification and IPC</p>																								
<p><b>B. FIELDS SEARCHED</b></p> <p>Minimum documentation searched (classification system followed by classification symbols)</p> <p>IPC 7 B24D B24B B23B</p>																								
<p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p>																								
<p>Electronic data base consulted during the international search (name of data base and, where practical, search terms used)</p> <p>EPO-Internal</p>																								
<p><b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b></p> <table border="1"> <thead> <tr> <th>Category °</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 2 363 102 A (WACHOWITZ ) 21 November 1944 (1944-11-21) page 1, line 5 -page 2, line 48; figures</td> <td>1, 3</td> </tr> <tr> <td>Y</td> <td>DE 200 22 301 U (REBIEWSKI MARC) 13 June 2001 (2001-06-13) page 3, line 11 - line 13; figures</td> <td>2, 4-9</td> </tr> <tr> <td>Y</td> <td>US 3 754 832 A (STICKLER) 28 August 1973 (1973-08-28) the whole document</td> <td>2</td> </tr> <tr> <td>X</td> <td>US 1 662 936 A (PHILIPP) 20 March 1928 (1928-03-20) page 1, line 31 - line 42; figures</td> <td>4-9</td> </tr> <tr> <td></td> <td>---</td> <td>1</td> </tr> <tr> <td></td> <td>-/-</td> <td></td> </tr> </tbody> </table>				Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 2 363 102 A (WACHOWITZ ) 21 November 1944 (1944-11-21) page 1, line 5 -page 2, line 48; figures	1, 3	Y	DE 200 22 301 U (REBIEWSKI MARC) 13 June 2001 (2001-06-13) page 3, line 11 - line 13; figures	2, 4-9	Y	US 3 754 832 A (STICKLER) 28 August 1973 (1973-08-28) the whole document	2	X	US 1 662 936 A (PHILIPP) 20 March 1928 (1928-03-20) page 1, line 31 - line 42; figures	4-9		---	1		-/-	
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																						
X	US 2 363 102 A (WACHOWITZ ) 21 November 1944 (1944-11-21) page 1, line 5 -page 2, line 48; figures	1, 3																						
Y	DE 200 22 301 U (REBIEWSKI MARC) 13 June 2001 (2001-06-13) page 3, line 11 - line 13; figures	2, 4-9																						
Y	US 3 754 832 A (STICKLER) 28 August 1973 (1973-08-28) the whole document	2																						
X	US 1 662 936 A (PHILIPP) 20 March 1928 (1928-03-20) page 1, line 31 - line 42; figures	4-9																						
	---	1																						
	-/-																							
<p><input checked="" type="checkbox"/> Further documents are listed in the continuation of box C.</p>		<p><input checked="" type="checkbox"/> Patent family members are listed in annex.</p>																						
<p>* Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the International filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the International filing date but later than the priority date claimed</p> <p>"T" later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>																								
<p>Date of the actual completion of the International search</p> <p>14 November 2003</p>		<p>Date of mailing of the International search report</p> <p>25/11/2003</p>																						
<p>Name and mailing address of the ISA</p> <p>European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016</p>		<p>Authorized officer</p> <p>Garella, M</p>																						

## INTERNATIONAL SEARCH REPORT

Internal Application No

PCT/GB 03/03563

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 678 380 A (ZAHURANEC ET AL.) 7 July 1987 (1987-07-07) abstract; figures -----	1
X	US 5 004 383 A (ELLIOTT JR) 2 April 1991 (1991-04-02) abstract; figures -----	1

## INTERNATIONAL SEARCH REPORT

Internal  
PCT/GB 03/03563Application No  
03/03563

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 2363102	A	21-11-1944	US	2291666 A	04-08-1942
			US	2343824 A	07-03-1944
DE 20022301	U	13-06-2001	DE	20022301 U1	13-06-2001
US 3754832	A	28-08-1973	AU	444582 B2	31-01-1974
			AU	3628571 A	07-06-1973
			BE	776042 A1	30-05-1972
			CA	946564 A1	07-05-1974
			DE	2159627 A1	08-06-1972
			DK	132307 B	24-11-1975
			FR	2117200 A5	21-07-1972
			GB	1344117 A	16-01-1974
			IT	943139 B	02-04-1973
			NL	7116397 A	05-06-1972
			SE	382941 B	23-02-1976
			ZA	7107647 A	30-08-1972
US 1662936	A	20-03-1928	NONE		
US 4678380	A	07-07-1987	AU	6763787 A	23-07-1987
			CA	1260251 A1	26-09-1989
			EP	0233698 A1	26-08-1987
			JP	62228319 A	07-10-1987
US 5004383	A	02-04-1991	NONE		